

*REMARKS*

The office action and cited reference have been carefully reviewed. Claims 1-17 have been rejected and remain pending.

*Claim Rejections under 35 USC §103*

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one skilled in the art, to modify the reference or combine teachings. Any proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. There must be a reasonable expectation of success and the prior art references must teach or suggest all of the claim limitations. See M.P.E.P. 2143. Conclusory statements cannot be relied on when dealing with particular combinations of prior art and specific claims. The rationale for combining references must be put forth. *In re Lee*, 61 U.S.P.Q.2d 1430, 1433. The Examiner can satisfy the burden of showing obviousness of the combination "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

In its decision in *In re Lee*, the Federal Circuit reiterated and clarified the principle that a conclusory and ungrounded statement of motivation to combine is legally unacceptable. Specifically, the Federal Circuit noted that conclusory statements regarding motivation to combine are in violation of the PTO's federal mandate. (See *Lee*, at 1434 ("Omission of a relevant factor [i.e. motivation to combine] required by precedent is both legal error and arbitrary agency action. ... Conclusory statements ... do not fulfill the agency's obligation...").) Thus, a simple statement of beneficial results that would follow from a combination is *not* a motivation to actually make the combination. The fact that a combination *can* be made to get the beneficial results that the Applicants disclosed does not amount to a motivation found *in the art* to make that very combination. See *McGinley v. Franklin Sports, Inc.* 262 F.3d 1339, 1351, 60 USPQ2d 1001, 1008 (Fed. Cir. 2001) ("The genius of invention is often a combination of known elements which in hindsight seems preordained. To prevent hindsight invalidation of patent claims, the law requires some 'teaching, suggestion or reason' to combine cited references.")

Claims 1 - 17 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Glauber et al. (U.S. Patent # 5,887,566). This ground of rejection is respectfully traversed.

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Application No.: 10/765,803

The Office Action states that Glauber '566 shows an engine system that determines a minimum amount of pilot fuel needed to ignite gaseous fuel in a combustion chamber, that pilot fuel is injected into at least one of a prechamber and the combustion chamber, that the pilot fuel is one of diesel fuel and engine oil, and that pilot fuel injection timing is determined. The Office Action also states that Glauber '566 determines a desired start of combustion location, that the start of combustion location is compared to a desired start of combustion location, and that the pilot fuel injection is adjusted if the start of combustion is not approximately equal to the desired start of combustion. The Office Action also states that Glauber '566 does not specify how the start of ignition is determined, just that it is determined by a control device 20 based on operating parameters of the engine and that it is the view of the Examiner that to use cylinder pressure as an engine operating parameter would have been obvious in order to determine timing of the ignition. The Applicant respectfully disagrees.

Independent claims 1, 11, and 14 require determining a minimum amount of pilot fuel needed to initiate combustion of gaseous fuel in a combustion chamber. As stated in the present application, to obtain the lowest NO<sub>x</sub> emissions, the least amount of pilot fuel that will ignite the combustible natural gas mixture is needed. The present invention determines and controls the minimum amount of pilot fuel injected that initiates combustion consistently without a misfire at the correct timing for each chamber. This results in the lowest possible NO<sub>x</sub> and UHC emissions by compensating for changes in operating conditions and operating just short of misfire.

Glauber '566 teaches a system that electronically controls ignition oil injection. No teaching or suggestion could be found in Glauber '566 of determining a minimum amount of pilot fuel needed to ignite gaseous fuel. Glauber specifically states:

The self-regulating system provides flexible presetting of the ignition oil timing so that the design point and operating point of the engine may be brought closer to the knocking limit thereby increasing performance and improving overall efficiency without exceeding acceptable NO<sub>x</sub> emission standards.

(See Glauber '566 at column 5, lines 8-10). Clearly, a system that improves overall efficiency without exceeding acceptable NO<sub>x</sub> emission standards does not minimize NO<sub>x</sub> emissions. Furthermore, it is respectfully submitted that the statement teaches away from minimizing emissions. Since a minimum amount of pilot fuel that will ignite a combustible gas mixture is required to obtain the lowest NO<sub>x</sub> emissions, it follows that Glauber '566 teaches away from using a minimum amount of pilot fuel. Therefore, it is respectfully submitted that Glauber '566

teaches away from determining a minimum amount of pilot fuel needed to initiate combustion of gaseous fuel in a combustion chamber as required by independent claims 1, 11, and 14.

Additionally, the principle of operation of Glauber '566 is to move the operating condition of the engine closer to the knock limit without causing the engine to knock. Knock is sensed by accelerometers to detect vibrations on the engine. If the vibration is at a level that approaches where knock begins, Glauber '566 adjusts the time at which combustion begins. Adjusting the timing merely involves retarding or advancing the time at which the switching of Glauber '566 is started. It does not involve determining the actual start of combustion. The only way to accurately determine start of combustion is with some form of in-cylinder sensor. An accelerometer such as those used by Glauber '566 mounts external to the engine block and is typically tuned to respond to the large accelerations that occur when knocking, or detonation, occurs. This potentially dangerous phenomenon creates very high amplitude accelerations typically in the 6-10 kHz range. Such signals (i.e., accelerations) are easily interpreted through knock sensors (e.g., accelerometers), but the start of combustion is not detected by knock sensors. Furthermore, Glauber '566 does not need to know the location of the start of combustion. No teaching or suggestion could be found of determining the start of combustion and adjusting the pilot fuel injection timing if the start of combustion location is not approximately equal to the desired start of combustion location. Modifying Glauber '566 so that Glauber '566 as modified determines a start of combustion and adjusts the pilot fuel injection timing would change the principle of operation of Glauber '566. Such a modification is prohibited by the M.P.E.P. (See M.P.E.P. 2143).

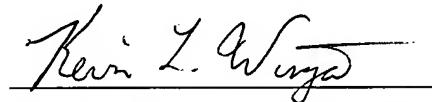
In view of the foregoing, it is respectfully submitted that the Examiner has not put forth a *prima facie* case of obviousness for independent claims 1, 11, and 14. Claims 2-10, 12-13 and 15-17 depend from independent claims 1, 11, and 14 and are believed to be patentable for the same reasons as claims 1, 11, and 14. The rejections of the dependent claims therefore do not need to be addressed in this response. It is therefore respectfully requested that the rejection of claims 1-17 be withdrawn.

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*Conclusion*

If, in the opinion of the examiner, a telephone conference would expedite the prosecution of the subject application, the examiner is invited to call the undersigned attorney.

Respectfully submitted,



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Date: July 28, 2005